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Indian Standard

AGRO TEXTILES — SHADE NETS FOR AGRICULTURE AND HORTICULTURE PURPOSES — SPECIFICATION

ICS 59.080.70;65.020.20

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

June 2012 **Price Group 3**

Technical Textiles for Agro-tech Sectional Committee, TXD 35

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Technical Textiles for Agro-tech Sectional Committee had been approved by the Textile Division Council.

The shade nets are mostly used for agriculture and horticulture applications particularly in countries like India where the scorching heat of the sun plays a major role in damaging the crops by sun burning and thus causing severe financial losses. The varying climatic conditions throughout the year, together with the slow but constant rising temperature in the summer months prove the need for shade nets to maximize growth and crop yields. The shade nets helps in controlling the temperature by accumulating the day heat to withstand the low temperatures of night thus help in off season ripening of fruits and vegetables. It also acts as a wind shield and prevents damage to young plants from damage.

No field trials have been conducted about the life cycle of the product. However, if the shade nets are used under the manufacturer's instruction, it is expected that the shade net shall last for 2 years.

The composition of the Committee responsible for the formulation of this standard is given in Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AGRO TEXTILES — SHADE NETS FOR AGRICULTURE AND HORTICULTURE PURPOSES — SPECIFICATION

1 SCOPE

This standard prescribes constructional and other requirements for shade nets for agriculture and horticulture purposes in protecting/increasing crop yield by providing controlled climatic conditions for the intended crops.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard the following definition shall apply.

3.1 Shading Factor — It is the percentage of light not transmitted through shade net.

4 MATERIALS

4.1 HDPE Tapes

Tapes shall be manufactured from HDPE granules (*see* IS 6192), which shall be UV stabilized by adding suitable UV stabilizer. The width of the tape used in the fabric shall be 1.70 mm and linear density of the tape shall be 40 Tex (400 Denier). As agreed to between the buyer and the seller, coloured tapes shall be manufactured using colour master batch. The denier of HDPE tape used in the manufacture of shade nets shall be subjected to the following tolerances:

a) 10 percent on individual value; and

b) 5 percent on average.

4.1.1 The heat shrinkage of the tape at 60°C shall not exceed 5 percent and shall not exceed 8 percent at 95°C. For determining the shrinkage, the tape shall be subjected to the specified temperature for a period of 10 min in an air circulating oven and hot water bath respectively.

4.2 Fabric

The fabric used in the manufacture of shade nets shall be woven on the flat knitting machines and shall have a minimum width of 3 m. A tape of about 1.7 mm width having the name of the manufacture at the end shall be provided for proper identification of manufacture.

4.3 Colour

The colour of the fabric shall preferably be green. However any other colour or a mixture of colour may be supplied as per the agreement between the manufacture and the supplier. The colour/shade shall be as specified in the contract or order. In case a sample has been agreed upon and sealed, the supply shall be made in conformity with the sample in such respects.

5 TYPES

Based on the shading factor, the material is classified as follows:

a) *Type I*, having shading factor of 50 percent;

b) *Type II*, having shading factor of 75 percent; and

c) *Type III*, having shading factor of 90 percent.

6 REQUIREMENTS

6.1 Dimensions and Mass

The shade nets shall be made to the shade and dimensions as specified in the contract or order. The dimensions shall be determined by the method prescribed in IS 1954. The following tolerance shall be permissible for length, width and mass (g/m^2):

Dimension	*Tolerance* Percent
Length	±1
Width	±1
Mass (g/m^2)	± 6

6.2 The shade net fabric shall confirm to the requirements specified in Table 1.

Table 1 Requirements of Shade Nets
(*Clauses* 6.2 *and* 9)

Sl No.	Characteristic(s)	Requirement(s)			Method of Test, Ref to
		Type 1	Type 2	Type 3	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Mass, g/m^2, *Min*	100	120	140	IS 1964
ii)	Average breaking strength of shade net fabric (Ravelled strip method, 325 mm × 70 mm) 1), N, *Min*:				IS 1969 (Part 1)
	a) Warpway	200	250	290	—
	b) Weft way	200	250	290	—
iii)	Retention of breaking strength after UV exposure, N, *Min*	85 percent of original actual value (fabric)			Annex B and IS 1969 (Part 1)
iv)	Colour fastness to artificial light 2)	4 or better	4 or better	4 or better	IS 2454
v)	Bursting pressure, kgf/cm^2, *Min*	5	6	9	IS 1966 (Part 1) or IS 1966 (Part 2)
vi)	Haze percentage, *Min*	15	18	22	Annex C

1) Width after ravelling = 50 mm, Gauge length = 200 mm.

2) Applicable for coloured shade nets only.

7 PACKING AND MARKING

7.1 Packing

The shade nets shall be packed in roll form in length of 50 m or as agreed to between the buyer and the seller.

7.2 Marking

7.2.1 The fabric roll shall be marked legibly with the following information:

a) Indication of the source of manufacture;
b) Type of shade net;
c) Declared length and width of the shade net;
d) Mass per square meter of the shade net;
e) Batch No. and date of manufacture; and
f) Any other information desired by the buyer.

7.3 BIS Certification Marking

The net may also be marked with the Standard Mark.

7.3.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and Rules and Regulations made thereunder. The details of the conditions under which a license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

8 SAMPLING

8.1 Lot

All shade nets rolls of same construction and type dispatched to a buyer against one dispatch note shall constitute a lot.

8.2 The number of shade nets rolls to be selected from a lot shall be as given in Table 2.

8.3 The conformity of the lot to the requirements of this standard shall be determined on the basis of the tests carried out on the samples selected from it.

9 NUMBER OF TEST SPECIMENS AND CRITERIA FOR CONFORMITY

The shade nets from each roll selected from the lot shall be tested for various requirements given in Table 1. Any fabric roll failing to meet one or more of the corresponding requirements prescribed in **6.1** and Table 1 shall be considered as defective. The lot shall be accepted, if no defective roll is found.

Table 2 Scale of Sampling and Criteria for Conformity
(*Clause* 8.2)

Sl No. (1)	No. of Fabric Rolls in the Lot (2)	No. of Fabric Rolls to be Selected (3)	Permissible No. of Defectives (4)
i)	Up to 50	5	0
ii)	51–100	8	0
iii)	101–300	13	0
iv)	301 and above	20	0

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
1954 : 1990	Determination of length and width of woven fabrics — Methods (*second revision*)
1964 : 2001	Methods for determination of mass per unit length and mass per unit area of fabrics (*second revision*)
1966	Textiles — Bursting properties of fabrics — Determination of bursting strength and bursting distension:
(Part 1) : 2009	Hydraulic method (*second revision*)
(Part 2) : 2009	Pneumatic method (*second revision*)
1969 (Part 1) : 2009	Textiles — Tensile properties of fabrics — Determination of maximum force and elongation at maximum force: Part 1 Strip method (*third revision*)
2454 : 1985	Method for determination of colour fastness of textile materials to artificial light (Xenon lamp) (*first revision*)
6192 : 1994	Textiles — Monoaxially oriented high density polyethylene tapes — Specification (*second revision*)

ANNEX B

[*Table* 1, *Sl No.* (iii)]

UV RESISTANCE TEST

B-1 TEST SPECIMENS

The test specimens for breaking strength shall be cut from the sample as specified in IS 1969 (Part 1).

B-2 TEST CONDITIONS

B-2.1 The test shall be carried out with fluorescent UV-B lamp (313 nanometer or its equivalent).

B-2.2 The duration of the test shall be 144 h (that is 6 days).

B-2.3 The test cycle shall be 8 h at 60 ± 3°C with UV radiation alternating after 4 h at 50 ± 3°C with condensation.

B-2.4 Irradiation level throughout the test shall be maintained at $0.63^{+0.03}_{-0.00}$ W/m².

B-3 TEST PROCEDURE

B-3.1 Determine the original average breaking strength of shade net specimens separately as per the test specified in IS 1969 (Part 1).

B-3.2 Expose the specimens alternately to ultraviolet light alone and to condensation in one respective cycle.

B-3.2.1 The type of fluorescent UV lamp, the timing of the UV exposure and the temperature of condensation shall be as specified in **B-2**.

B-3.3 Determine the average breaking strength of the specimens separately after UV exposure as mentioned above.

B-3.4 Determine the percent retention of original strength as follows:

$$\text{Percent retention of original breaking strength} = \frac{b}{a} \times 100$$

where

a = average breaking strength before UV exposure as obtained in **B-3.1**; and

b = average breaking strength after UV exposure as obtained in **B-3.3**.

NOTES

1 The UV source is an array of fluorescent lamps (with lamp emission concentrated in the UV range).

2 Condensation is produced by exposing the test surface to a heated, saturated mixture of air and water vapour, while the reverse side of the test specimen is exposed to the cooling influence of ambient room air.

ANNEX C

[*Table* 1, *Sl No.* (vi)]

TEST METHOD FOR HAZE PERCENTAGE OF SHADE NETS

C-1 GENERAL

This test method is used to measure the haze percentage of the shade nets.

C-2 SAMPLING

C-2.1 Laboratory Sample

For the laboratory sample take a swatch extending the full width of the product, of sufficient length along the selvage from each sample roll so that the requirements of **C-2.2** can be met.

C-2.2 Test Specimens

Select from the laboratory sample, sufficient number of samples each having a minimum diameter of 50 mm to facilitate clamping. Space the specimens along a diagonal on the unit of the laboratory sample. Take no specimens nearer the selvage or edge of the shade nets.

C-3 CONDITIONING

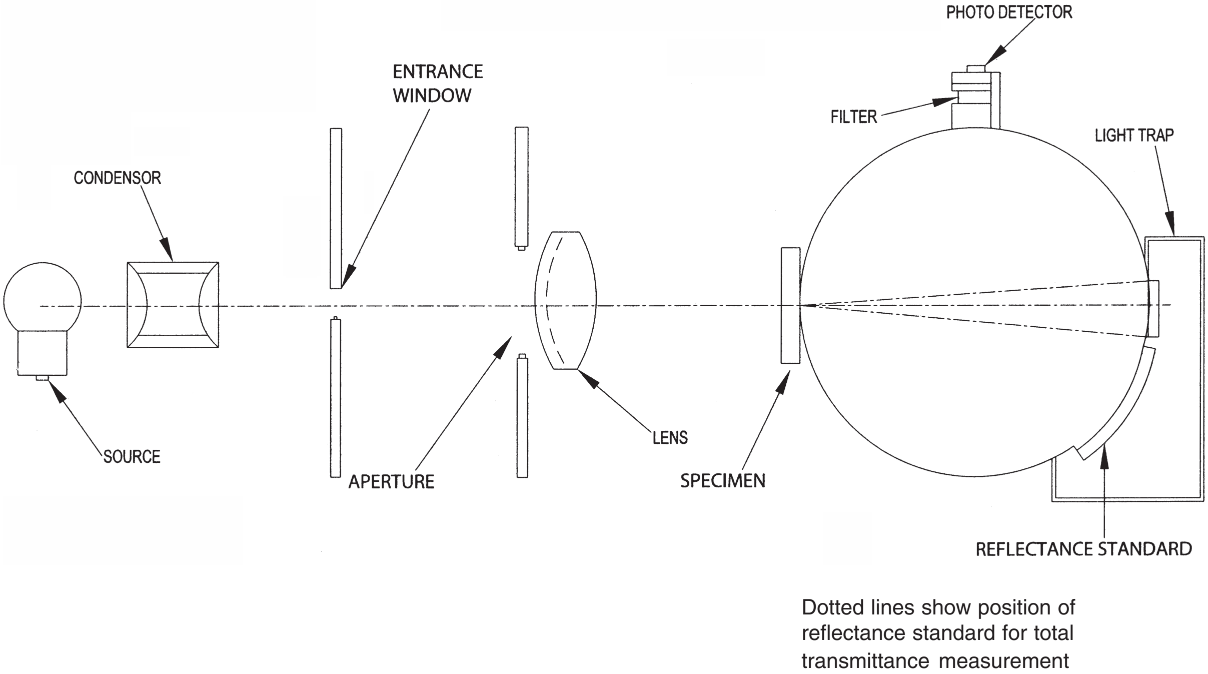
Bring the specimens to moisture equilibrium in the atmosphere for testing shade nets (65 ± 5 percent relative humidity and 27 ± 2°C temperature). Equilibrium is considered to have been reached when the increase in the mass of the specimen, in successive weightings made at intervals of not less than 2 h, does not exceed 0.1 percent of the mass of the specimen.

C-4 APPARATUS

C-4.1 Hazemeter — The instrument used for measurement shall meet the geometric and spectral requirements. The schematic diagram of the apparatus is given in Fig. 1.

C-4.2 A light source and a photo detector shall be supplied, and the combination shall be filtered to provide an output corresponding to the luminosity response of the 1931 CIE Standard Colorimetric Observer with CIE Standard Illuminant C or, alternatively, Illuminant A. The output shall be proportional to within 1 percent to the incident flux over the range of flux used. The photometric stability for source and detector must be constant throughout the test of each specimen.

C-4.3 Use an integrating sphere to collect transmitted flux; the sphere may be of any diameter as long as the total port areas do not exceed 4.0 percent of the internal reflecting area of the sphere. The entrance and exit ports shall be centered on the same great circle of the sphere, and there shall be at least 170° of arc between centres. The exit port shall subtend an angle of 8° at the center of the entrance port. With the light trap in position, without the specimen, the axis of the irradiating beam shall pass through the centers of the entrance and exit ports. For a haze meter, position the photocell or



Dotted lines show position of reflectance standard for total transmittance measurement

FIG. 1 SCHEMATIC DIAGRAM OF HAZEMETER

photocells on the sphere 90 ± 10° from the entrance port and baffle it from direct exposure to the entrance port. In the pivotable modification where the interior wall adjacent to the exit port is used as the reflectance reference, the angle of rotation of the sphere shall be 8.0 ± 0.5°.

C-4.4 Illuminate the specimen by a substantially unidirectional beam; the maximum angle that any ray of this beam may make with the beam axis shall not exceed 3°.

C-4.5 When the specimen is placed against the entrance port of the integrating sphere, the angle between the perpendicular to the specimen and a line connecting the centers of entrance and exit ports shall not exceed 8°.

C-4.6 When the beam is unobstructed by a specimen, its cross-section at the exit port shall be approximately circular, sharply defined, and concentric within the exit port, leaving an annulus of 1.3 ± 0.1° subtended at the entrance port.

C-4.7 The surfaces of the interior of the integrating sphere, baffles, and reflectance standard, if used, shall be of equal reflectance, matte, and highly reflecting throughout the visible spectrum.

C-4.8 A light trap shall be provided that will absorb the beam completely when no specimen is present, or the instrument design shall obviate the need for a light trap.

C-5 PROCEDURE

C-5.1 Determine the following four readings:

Reading Designation	*Specimen in Position*	*Light Trap in Position*	*Reflectance Standard in Position*	*Quantity Represented*
T_1	No	No	Yes	Incident light
T_2	Yes	No	Yes	Total light transmitted by specimen
T_3	No	Yes	No	Light scattered by instrument
T_4	Yes	Yes	No	Light scattered by instrument and specimen

C-5.2 Repeat readings for T_1, T_2, T_3 and T_4 with additional specified positions of the specimen to determine uniformity.

C-6 CALCULATION

C-6.1 Calculate total transmittance, $T_t = T_2/T_1$

C-6.2 Calculate diffuse transmittance, T_d as follows:

$$T_d = \frac{T_4 - T_3\left(\frac{T_2}{T_1}\right)}{T_1}$$

C-6.3 Calculate percent haze as follows:

$$\text{Haze} = \frac{T_d}{T_d} \times 100$$

ANNEX D

(*Foreword*)

COMMITTEE COMPOSITION

Technical Textiles for Agro-tech Sectional Committee, TXD 35

Organization	*Representative(s)*
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Business Co-ordination House Pvt Ltd, New Delhi	Shri Samir Gupta Shrimati Ritika Gupta (*Alternate*)
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